

Balancing Planarization of Layers and the Effect of Underlying Structure on the
Metrology Signal

ABSTRACT

5 The present invention includes a method and system for identifying an
underlying structure that achieves improved planarization characteristics of layers
while minimizing introduction of random and/or systematic noise to the reflected
metrology signal.

10 One embodiment of the present invention is a method of designing
underlying structures in a wafer with pads of varying sizes and varying loading
factors, and selecting the design of pads that yield a reflected metrology signal
closest to the calibration metrology signal and that meet preset standard
planarization characteristics. Another embodiment is a method of designing
underlying structures with random shapes of varying sizes and varying loading
15 factors. Still another embodiment is the use of periodic structures of varying line-
to-space ratios in one or more underlying layers of a wafer, the periodicity of the
underlying periodic structure being positioned at an angle relative to the direction
of periodicity of the target periodic structure of the wafer. The present invention
also includes a system for selecting an underlying structure design that balances
20 planarization and optical metrology objectives for a target structure comprising a
wafer fabricator, a planarizer, a layer profiler, an optical metrology device, and a
selector for the selecting the design of underlying structure that yields a reflected
metrology signal closest to the calibration metrology signal and where the
planarized surfaces meet preset standard planarization characteristics.

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